MAY, MDCCCLIX.

THE ZOOLOGIST:

A

POPULAR MONTHLY MAGAZINE

OF

NATURAL HISTORY

AND

JOURNAL FOR RECORDING FACTS & ANECDOTES

RELATING TO

QUADRUPEDS, BIRDS, REPTILES, FISHES, ANNELIDES,
INSECTS, WORMS, ZOOPHYTES, &c.

THEIR HABITS, FOOD, RETREATS, OCCASIONAL APPEARANCE,
MIGRATIONS, NESTS AND YOUNG.

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Entomological Club.—The *names* of the Micro-Lepidoptera having now b arranged in accordance with the second edition of Doubleday's Synonymic List, donation of *specimens* is most earnestly solicited. This has heretofore been the we point of the collection; and many entomologists who have derived great assistance fr the rich collection of Macro-Lepidoptera have expressed great disappointment at t absence of the Micros.—*E. Newman, Curator*, 7, *York Grove, Queen's Road, Peckha*

This day, March 1st, 1859, is published, price 2s., the Second Edition of

HENRY DOUBLEDAYS' SYNONYMIC LIST OF BRITIS BUTTERFLIES AND MOTHS. This is the only complete List of Brit Lepidopterous Insects. It contains the names and synonymes of every Butterfly and M discovered in Great Britain up to the date of publication. The arrangement is founded that of M. Guenée, the *Facilis Princeps* of Lepidopterists. The great object in printi this most complete and laborious work is to establish a uniform nomenclature, the diver hitherto existing, both in names and arrangement, being a source of confusion and p plexity to all beginners. Not only is Mr. Doubledays' own collection (the normal collect of British Lepidoptera) arranged and named in accordance with this list, but Universities of Oxford and Cambridge adopt it in their *Accentuated List* recently publish

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John Van Voorst, Paternoster Row.

Food-plant of Bryophila perla.—We have a colony of the larvæ of Bryophila perla that interests me vastly. As the little fellows have fixed their quarters on the house-side I have not got far to go to observe their operations. During the day they carefully secrete themselves in their sand nests; as they take care to make up the door-way on entering their retreats, there is no chance of catching a glimpse of them then. The early morning is their time of feeding; then old and young are out, but soon after nine they retire for the day. The plant that takes their fancy is the Lecidea confluens, a crustaceous lichen that dots over old walls with its cracked and weather-beaten patches. The shields or tubercles of this lichen are the chief attraction; these they gnaw, removing the black crusts and exposing the white under-surface to view. Their depredations are thus readily seen in the morning, as the white tops are very conspicuous in the sunshine. The Lecideas, it is well known, abound in tartar, none probably more than L. confluens. Soon after 9 o'clock the larvæ withdraw to their nests for the day. It is stated by Westwood that the larva of B. perla feeds on the lichens, but as there are upwards of sixty Lecideas, not to speak of other genera, and many of these affect rocks and old walls, I think you will be interested to learn the species that feeds the caterpillar with us. The stone of which the house is built is granite. I would just add a few words on the larva itself: it is, indeed, as you term it, "gaily-coloured;" the dark livery is relieved by the orange-coloured stripe down the back; this stripe is interrupted with dark spots, so as to give it the appearance of a chain-work of little hearts. The tubercles have each a single hair, and are black, glistening like the head. The sides of the little creature are beautifully mottled with slate-colour.—*Peter Inchbald; Storthes Hall, Huddersfield; March* 9. 1858.—'*Intelligencer.*'

Appeal on behalf of Mr. Jethro Tinker.—Will you permit me to call the attention of your readers to the following extract from a circular, issued by a Committee of the friends of Mr. Jethro Tinker, of Stalybridge, in order that those naturalists who can afford to assist one of Nature's gentlemen in his old age may have the opportunity of giving each his mite? for I feel certain that his case only requires to be known to ensure the support of all thoroughly practised naturalists. Mr. Tinker is the father of a numerous family of naturalists; to his kindness pretty nearly all the Lancashire naturalists are indebted for some part of their knowledge; for fifty years he has worked as none but a pure lover of nature can work, and for information on specimens none ever applied to him in vain. Twenty years ago I thought his collection of Coleoptera and Lepidoptera the result of superhuman labour; they may have fallen behind the present cabinets, yet they were part of the materials out of which our general information was culled. As a botanist he stands second to none in his district, and has always held a leading place amongst muscologists. He is now sick, consequently unable to attend to his work, and being above seventy years of age I think him fairly entitled to any support the liberal-minded naturalists of the present day can afford him. Will you Mr. Editor kindly undertake to receive any gratuities which may be forwarded to you for him? "A number of friends, admirers of Mr. Jethro Tinker, the well-known botanist and entomologist, believing him to be highly deserving of some substantial token of sympathy in his declining years, assembled on the 19th of February last, Mr. John Holden in the chair, when it was unanimously resolved:—1st 'That Mr. Jethro Tinker having for half a century assiduously devoted himself to the interests

BRITISH MUSEUM

and propagation of the sciences of Botany, Entomology and gardening; and who, possessing a knowledge of the beauties of Nature, which he has at all times, with most disinterested willingness, imparted to others, leading many to look from Nature up to Nature's God, this meeting believes him entitled to the admiration of his fellow men, and resolve that a substantial testimony of esteem be awarded to him.' 2nd 'That the following gentlemen be appointed a committee to carry out the above resolution, *viz.*:—Messrs. G. Smith, T. Hague, J. Miller, J. Holden, M. Wild, J. Hallsworth, J. Knott, G. Winterbottom, J. Castle and G. Chadwick.' 3rd. 'That Mr. Thomas Hague act as Treasurer, and Mr. G. Stelfox Honorary Secretary.' The Committee take this opportunity of intimating that the claims of Mr. Tinker to public sympathy are so universally acknowledged that little need be advanced in their support. His services in the cause of Botanical science, Entomology, &c., have done much towards perfecting many in the study of Nature's works. Mr. Tinker has arrived at the age allotted to man, and a little assistance, at his time of life, will do much towards smoothing life's rugged path in his latter days."—*C. S. Gregson; Fletcher Grove, Stanley, near Liverpool, March* 3, 1859.

[I cannot object to receive any contributions that may be offered, but suggest that the more direct mode would be to transmit to Mr. Hague, the authorized Treasurer.—*E. Newman.*]

Notice of the Various Species of Bovine Animals. By the Editor of the 'Indian Field.'

(Continued from p. 6485.)

THE gayal—*Bos frontalis*, Lambert; *B. gavœus*, Colebrooke; *B. sylhetanus*, F. Cuvier; *Gavœus frontalis*, Gray;* *Gavaya*, Sanskrita; *Gavai* or *Gayál*, Hind.; *Gobay-goru*, Beng.; *Mit'hun* or *Met'hana*, mountains bordering on Asam; *Shiall*, of the Kukis or Lunklas of Chittagong; *Jhongnua*, Mughs (if the latter does not rather apply to the Burmese *Tsoing*, which is identical with the banteng of the Archipelago†).

Another fine Indian bovine, that has been much confounded with the last, which it resembles, in many particulars while in other respects it differs strikingly and conspicuously. The general figure is heavy and recalls to mind the buffalo; spinal ridge much less elevated than the gaour, but still a conspicuous feature of the beast; dewlap tolerably well developed; and the horns curve simply outwards and a little upwards, their points never hooking inwards as in the gaour. Both in a wild and tame state, this species inhabits the hilly regions bordering the valley of the Brahmaputra, as also the Chittagong and Tippera hills; but we have not been able to trace it further southward on sufficiently reliable evidence—not even in the Ya-ma-doung mountains, which separate Arakan from Pegu, though it is likely enough to occur there, and also to spread far eastward. Helfer, indeed, notices "Bison guodus" (evidently a misprint for gavœus) as an inhabitant of the Tenasserim provinces; but he is not sufficient authority, and we cannot learn that his statement has been confirmed. The gayal is everywhere a hill species, and does not thrive in the plains, away from its native forests; and we have observed that both the gaour and the gayal avoid the sunshine in lower Bengal, even during the height of the cold season. As remarked by Mr. Macrae, the gayal "delights to range about in the thickest forest, where he browses, evening and morning, on the tender shoots and leaves of different shrubs; seldom feeding on grass when he can get these. To avoid the noon-day heat, he retires to the deepest shade of the forest—preferring the dry acclivity of the hill to repose on, rather than the low swampy ground below; and never, like the buffalo, wallowing in mud. He is of a dull heavy appearance," continues that gentleman, "yet of a form that indicates both strength and activity, and which approaches nearly to that of the wild buffalo; his head is set on like the buffalo's, and is carried much in the same manner, with the nose projecting forward; but in the shape of the head he differs considerably from both the buffalo and cow, the head of the gayal being much shorter from the crown to the nose, but much broader between the horns than that of either; he has a full eye, and as he advances in age often becomes blind; but it is uncertain whether from disease, or from natural decay. The withers and shoulders of the gayal rise higher in proportion than those of the buffalo or cow, and its tail is shorter, seldom falling lower [*i. e.* its terminal tuft of hair] than the bend of the ham [hock-joint!]. Its colour is in general brown, varying from a light to a deep shade; it has at times a white forehead and [always?] white legs, with a white belly and brush. The hair of the belly is invariably of a lighter colour than that of the back and flanks. The gayal calf is of a dull red colour, which gradually changes to a brown as it advances in age.

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* Nobody who knows [has observed] the living gaour and gayal would think of placing them in separate sub-divisions.

† In Orissa, as we have seen, the gaour is designated by the name gayal; both, of course, being but variations of the same root.

"The disposition of this animal is gentle; even when wild in his native hills, he is not considered to be a dangerous beast, never standing the approach of man, much less bearing his attack. The Kukis hunt the wild ones for the sake of their flesh.

"Gayals have been domesticated among the Kukis from time immemorial; and without any variation in their appearance from the wild stock. No difference whatever is observed in the colour of the wild and tame breeds; brown of different shades being the general colour of both. The wild gayal is about the size of the wild buffalo of India. The tame gayal, among the Kukis, being bred in nearly the same habits of freedom, and on the same food, without ever undergoing any labour, grows to the same size as the wild one.

"He lives to the age of fifteen or twenty years, and when three years old the gayal cow receives the bull; goes eleven months with young, and does not again engender until the following season, after she has brought forth. She thus produces a calf once only in three years, and so long an interval between each birth must tend to make the species rare; the calf sucks his dam for eight or nine months, when he is capable of supporting himself. The Kukis tie up the calf until he is sufficiently strong to do so. The gayal cow gives very little milk, and does not yield it long; but what she gives is of a remarkably rich quality—almost equally so with the cream of other milk, which it resembles in colour. The Kukis make no use whatever of the milk, but rear the gayals entirely for the sake of their flesh and skins; they make their shields of the hide of this animal; the flesh of the gayal is in the highest estimation among the Kukis, so much so that no solemn festival is ever celebrated without slaughtering one or more gayals, according to the importance of the occasion.

"These animals lose their sight as they grow old, and are subject to a disease of the hoof, which often proves fatal at an early age; when the Kuki considers the disease beyond the hope of cure he kills the gayal and eats its flesh, which constitutes his first article of luxury.

"The Kukis train their gayals to no labour, although, from the great strength and gentle disposition of this animal, he must be very competent to every purpose, either of draught or carriage, to which the buffalo or the ox is applicable.*

"The domesticated gayals are allowed by the Kukis to roam at large during the day through the forest, in the neighbourhood of the village; but, as evening approaches, they all return home of their own accord; the young gayal being early taught this habit, by being regularly fed every night with salt, of which he is very fond; and from the occasional continuance of this practice, as he grows up, the attachment of the gayal to his native village becomes so strong, that when the Kukis migrate from it they are obliged to set fire to their huts, which they are about to leave, lest their gayals should return thither from their new place of residence before they become equally attached to it as to the former, through the same means.

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* Mr. G. Harris remarks, however, of the gayal cow, that "she is very quiet, is used for all the purposes of the dairy, as also (I have been informed by the natives) for tilling the ground, and is more tractable than the buffalo." We suppose that the bulls rather are used for the latter purpose.

" The wild gayal sometimes steals out from the forest in the night, and feeds in the rice-fields bordering on the hills. The Kukis give no grain to their cattle. With us the tame gayals feed on calai (*Phaseolus max*);* but, as our hills abound with shrubs, it has not been remarked what particular kind of grass they prefer.†

" The Hindus, in this province, will not kill the gobay, which they hold in equal veneration with the cow. But the 'As'l gayal,' or 'seloi,' [i. e. the gaour], they hunt and kill, as they do the wild buffalo. The animal here alluded to has never been domesticated; and is, in appearance and disposition, very different from the common gayal, which has just been described. The natives call him the 'As'l gayal,' in contra-distinction to the 'gobay.' The Kukis distinguish him by the name of 'seloi,' and the Mughs and Burmans by that of 'phanj;' and they consider him (next to the tiger) the most dangerous and the fiercest animal of their forests." No! this Burmese phanj is the f'hain apud Helfer, more correctly 'tsain,' or 'tsoing,' distinct both from the gaour and gayal, and a particularly timid and inoffensive beast, identical (as we have before mentioned) with the Javanese banteng.

" The gayal," Mr. Elliot writes from Tippera, " is little known to the natives here; it is principally considered as an inhabitant of the Chatgaon (Chittagong) Hills. In conversation with people belonging to the Raja of Tippera, on the subject of this beast, I have understood that it is known in the recesses of the more eastern part of the Tippera Hills, but has never been caught [!] In the past year some of these animals [gaours ?] were seen in a herd of elephants, and continued sometime with the herd; but they were alarmed at the noise used in driving the elephants, and escaped being secured in the fenced enclosure. The 'khedda' of that season was nearly five hours' journey from the skirts of the hills.

" This animal is found wild, but is readily domesticated; though, in this state he essentially partakes of wild habits. I have some gayals at Mannamutty; and, from their mode of feeding, I presume that they keep on the skirts of the valleys, where they can browse. They will not touch grass if they can find shrubs.

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* Phaseolus mungo, *L.*; P. max of Roxburgh.

† They graze readily enough on the ordinary grasses of Lower Bengal, when they have not the opportunity of browsing.

"While kept at Kamerlah (Comilla) which is situate in a level country, they used to resort to the tanks and eat on the sides; frequently betaking themselves to the water to avoid the heat of the sun. However, they became sickly and emaciated, and their eyes suffered much; but on being sent to the hills they soon recovered, and are now in a healthy condition. They seem fond of the shade; and are observed in the hot weather to take the turn of the hills, so as to be always sheltered from the sun. They do not wallow in the mud like buffalos; but delight in water, and stand in it during the greatest heat of the day, with the front of their heads above the surface.

"Each cow yields from two and a half to about four seers (from five to eight pints) of milk, which is rich, sweet, and almost as thick as cream; it is of high flavour, and makes excellent butter."

Mr. Dick writes:— "Gayals are not confined to the woods; they are domesticated, but wild gayals are found in the mountains of Butan, &c. They are kept in a tame state by the people who inhabit the Kalanaga Hills, near Sylhet, on the eastern border of the province of Kachar, west of Manipur, and north of a tract dependent on Tippera. The tame gayals, however long they may have been domesticated, do not at all differ from the wild, unless in temper; for the wild are fierce and intractable. The colour of both is the same—namely, that of the antelope, but some are white and others are black; not any spotted or pie-bald [we have seen one much blotched with white]. They graze and range like other cattle; and eat rice, mustard, chiches, and any cultivated produce, as also chaff and chopped straw."

Buchanan Hamilton's description is still more elaborate, and very excellent. "The Gayal," he remarks, "generally carries its head with the mouth projecting forward like that of a buffalo. The head at the upper part is very broad and flat, and is contracted suddenly towards the nose, which is naked like that of the common cow. From the upper angles of the forehead proceed two thick, short, horizontal processes of bone, which are covered with hair; on these are placed the horns, which are smooth, shorter than the head, and lie nearly in the plane of the forehead. They diverge outward, and turn up with a gentle curve: at the base they are very thick, and are slightly compressed, the flat sides being toward the front and the tail. The edge next the ear is rather the thinnest, so that a transverse section would be somewhat ovate. Towards their tips the horns are rounded, and end in a sharp point. The eyes resemble those of the common [humped] ox; the ears are much larger, broader, and blunter than those of that animal.*

"The neck is very slender near the head; at some distance from which a dewlap commences, but this is not so deep, nor so much undulated, as in the Bos zebu or Indian ox.†

"The dewlap is covered with strong longish hair, so as to form a kind of mane on the lower part of the neck; but this is not very conspicuous, especially when the animal is young."‡

If we remember rightly, F. Cuvier's figure (copied from a drawing sent by Duvaucel) represents the dewlap as unusually large. In a carefully executed drawing of a fine bull, which was taken under our immediate superintendence from the living animal, the skin is shown to be a little pendent beneath the lower jaw, but not so at the throat, below which again it descends and forms one obtuse angle in front of the chest, and another between the knees, or rather just anteriorly to the knees and a little above them. In this individual the tail-tuft reached a little below the hocks. Buchanan Hamilton continues:—"The tail is covered with short hair, except near the end, where it has a tuft like that of the common ox; but, in the gayal, the tail descends no lower than the extremity of the tibia.

"The legs, especially the fore ones, are thick and clumsy; the false hoofs are much larger than those of the zebu; the hinder parts are weaker in proportion than the fore hand, and, owing to the contraction of the belly, the hinder legs—although, in fact, the shortest—appear to be the longest.

"In place of the hump, which is situated between the shoulders of the zebu, the gayal has a sharp ridge, which commences on the hinder part of the neck, slopes gradually up till it comes over the shoulder-joint, then runs horizontally almost a third part of the length of the back, where it terminates with a very sudden slope. The height of this ridge makes the neck appear much depressed, and also adds greatly to the clumsiness of the chest, which, although narrow, is very deep. The sternum is covered by a continuation of the dewlap. The belly is protuberant, but in its hinder part is greatly contracted. The rump, or 'os sacrum,' has a more considerable declivity than that of the European ox, but less than that of the zebu.

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* But they are not so broad as those of B. Taurus. Like those of the gaour, we should term them broadly ovate.

† From the name above given, it is evident that Buchanan Hamilton regarded his Bos Zebu as distinct from B. Taurus.

‡ With regard to dewlap, it may be remarked that the humped bull has this preposterously developed occasionally, almost reaching to the ground. Such a bull is figured, as we remember, in one of the drawings bequeathed by General Hardwicke to the British Museum; and we have seen others like it. The large up-country cattle have also generally much pendent skin, and, what is curious, not unfrequently a very considerable appearance of præputial skin in the cows; but this nevertheless cannot be truly præputial, for reasons unnecessary to discuss here.

" The whole body is covered with a thick coat of short hair, which is lengthened out into a mane on the dewlap, and into a pencil-like tuft at the end of the tail. From the summit of the head there diverges, with a whorl, a bunch of rather long coarse hair, which lies flat, is usually lighter coloured than that which is adjacent, and extends towards the horns and over the forehead. The general colour of the animal is brown in various shades, which very often approaches to black, but sometimes is rather light. Some parts, especially about the legs and belly, are usually white; but, in different individuals, these are very differently disposed."

We have seen a bull gayal, which must have stood at least 15½ or 16 hands high at the spinal ridge, and whose horns were about 3 feet from tip to tip; but this is considerably above the average size, and he stood like a giant among his adult companions of both sexes. This was in Barrackpore Park, in the time of Lord Auckland. There were five or six splendid gayals then in the park, which Lord Ellenborough (as we were informed) gave away to whoever would accept of them; and they fell into native hands, and very soon died off and were lost to science. At that time, we believe, not a specimen (either stuffed skin or skeleton, or so much as a frontlet or even a horn) existed in any museum, and the species is still extremely rare in zoological collections. In that of the Asiatic Society, Calcutta, there is now a complete skeleton of a moderately fine adult bull, the skull of a finer bull, with the horn-cores only (not the corneous sheaths), which is believed to be that of a wild individual, and was picked up in one of the hill-jungles bordering on Asam; also the stuffed skin of a young bull, and another of a large calf. The height of the skeleton is 4 ft. 4 in. from the summit of the spinal ridge; and the large skull measures 15 in. across between the bases of the horns anteriorly, 18½ in. in length from frontal ridge to tips of nasals, and 11½ in. greatest width at the orbits. For figures of a fine gayal skull, with those of the gaour and yak for comparison, vide 'Journal of the Asiatic Society,' vol. x., p. 470.

" The cry of the gayal," remarks Buchanan Hamilton, " has no resemblance to the grunt of the Indian ox; but a good deal resembles that of the buffalo. It is a kind of lowing, but shriller, and not nearly so loud as that of the European ox. To this, however, the gayal approaches much nearer than it does to the buffalo." We have tried to describe the voice of the gayal in our notice of the gaour.

Baron Cuvier entertained the strange opinion (expressed both in his 'Règne Animal' and his 'Ossemens Fossiles') that this species was merely a mixed race between the Indian humped cattle and the buffalo. There have been several instances of its breeding with the former, under peculiar circumstances; and in one which fell under our own observation, the sire being a gayal, a cow-calf was produced, which, to all appearance, scarcely differed from a cow gayal; it died when about half grown, and the skull is now in the Calcutta museum. The sire was the bull whose portrait has been before alluded to; and, ponderous beast as he looked, he could leap a fence or gate with surprising facility. Mr. G. Harris remarks of the species—"He is naturally very bold, and will defend himself against any of the beasts of prey." All that we have seen, however, were the most gentle and tractable creatures imaginable; but, as Turner tells us, in the narrative of his 'Embassy to Butan' (we have not the book at hand), these good-natured animals, fed on stimulating food, are there trained for conflict, and no doubt can be worried into fierceness;* but it is

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* We have since hunted up the passage, which is as follows:—

"Towards the close of the afternoon we were entertained with the exhibition of a bull-fight, between two animals, the strongest and fiercest of the species [genus] I ever beheld. They were of a foreign breed, from a more eastern part of the same range of mountains, and in Bengal are termed gyal. Their heads were small, their necks thick, their chests prodigiously deep, and their fore-legs remarkably short. The carcase lessened towards the loins, which made the hind-legs appear much longer than the fore. Their colour was a dark brown, almost black. They were led to the ground between many Booteeas, well secured, with strong ropes fastened to them: they struggled violently, as impatient of restraint, and their prominent eyes rolled with fury, as if they were instructed in the fierce purpose for which they were brought hither. Many men took post round the field of battle, armed with large bludgeons. The bulls were released on opposite sides; and the moment they felt their liberty, they tore up the turf with their horns, elevated the spines of their backs, and appeared animated with the strongest symptoms of rage. They did not at the first instant rush together, but, turning sideways, eyed each other askance, all the while making a slow circular advance, until a very small distance divided them; they then turned, opposing a full front, and ran impetuously, their heads meeting together with an astonishing concussion. The horns, which constitute the guard as well as weapons of offence, were now entangled, and they maintained the struggle, like wrestlers, for half an hour, with surprising exertions of strength; the ground yielding to their heels as they not their natural disposition; and the remarkable gentleness of this animal is well exemplified by the following narrative of how whole herds of wild gayals are tamed at a fell swoop.

"The Kukis," writes Mr. Macrae, "have a very simple method of training the wild gayals. It is as follows:—On discovering a herd of wild gayals in the jungles, they prepare a number of balls of the size of a man's head, composed of a particular kind of earth, salt, and cotton; they then drive their tame gayals towards the wild ones, when the two soon meet and assimilate into one herd—the males of the one attaching themselves to the females of the other, and *vice versâ.* The Kukis now scatter their balls over such parts of the jungle as they think the herd most likely to pass, and watch its motions. The gayals, on meeting these balls as they go along, are attracted by their appearance and smell, and begin to lick them with their tongues; and relishing the taste of the salt, and the particular earth composing them, they never quit the place until all the balls are destroyed. The Kukis having observed the gayals to have once tasted their balls, prepare what they consider a sufficient supply of them to answer the intended purpose, and as the gayals lick them up they throw down more; and to prevent their being so readily destroyed, they mix the cotton with the earth and salt. This process generally goes on for three changes of the moon, or for a month and a half; during which time the tame and wild gayals are always together licking the decoy-balls; and the Kuki, after the first day or two of their being so, makes his appearance at such a distance as not to alarm the wild ones. By degrees he approaches nearer and nearer, until at length the sight of him has become so familiar that he can advance to stroke his tame gayals on the back and neck without frightening away the wild ones. He next extends his hand to them, and caresses them also, at the same time giving them plenty of his decoy-balls to lick; and thus in the short space of time mentioned he is able to drive them along with

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pressed their brows, and alternately retreated and pushed forwards in the conflict. At length, as their strength diminished, and when victory stood on the point of turning to the most powerful, they were parted. The weakest was driven away by the Booteeas armed with bludgeons; the other, hampered with ropes, was conducted to his stall highly indignant and full of wrath. In this manner commonly the battle ends; for, if they can prevent it, they never suffer the strongest bull to pursue his advantage, which would terminate in the certain destruction of his antagonist, who is also exposed to the greatest danger, if he should happen to be thrown down in the conflict. As they are trained for this particular purpose, the Booteeas exert their utmost endeavours to preserve them for future sport."

his tame ones to his parrah or village, without the least exertion of force or compulsion, and so attached do the gayals become to the parrah, that when the Kukis migrate from one place to another they always find it necessary to set fire to the huts they are about to abandon, lest the gayals should return to them from the new grounds, were they left standing. Experience has taught the Kuki the necessity of thus destroying his huts.

"It is a fact worthy of remark, that the new and full moon are the periods at which the Kukis generally commence their operation of catching the wild gayals, from having observed that at these changes the two sexes are most inclined to associate. The same observation has been often made to me by the elephant catchers."

The taming of the wild elephant is truly an astonishing feat to be performed by the class of people who engage in it; and this wholesale domestication of the gayal is most instructive, and reminds us that the subjugation of almost every domestic animal was achieved, so far as we know, by people in a similar primeval state of existence, where little real transition of mode of life was required on the part of the creatures who were won over to servitude and not forced into subjection. Civilized men exterminate, but do not domesticate—have not hitherto done so, at least; nor is a cultivated country adapted for the kind of procedure detailed.

On looking over this account, we find that the gayal cow is scarcely described; but little more need be said than that she is altogether of a slighter build than the bull, with the forehead less broad, and the horns shorter and not so thick. We have borrowed largely from the seventh volume of the 'Transactions of the Linnean Society,' and from the eighth volume of the 'Asiatic Researches;' compiling a tolerably complete description of the beast under notice, by no means however unassisted by familiar personal observation of the domestic animal.

The banteng (*Bos sondaicus*, Müller; *B. bentinger*, Temminck; *B. leucoprymnus*, Quoy and Gaimard;* *Banteng* of Europeans in Java; *Sapi leweng*, *Lembo wono* and *Sampi halas* of Javanese—all names signifying "wild cow;" *Rompo* of Dyáks, in Borneo; *Poung*, *P'hain*, *Tsain* or *Tsoing* of Burmese). After careful comparison of the skull of an old (though not large) bull from Pegu, the horn of another from the Arakan side of the mountains which separate the two provinces, with the admirable figures of the skulls of both sexes, at different ages, of the Javanese banteng, published by Dr. Salomon Müller, as also with two superb frontlets of bulls from Java, we can come to no other conclusion than that they are one and the same species, and upon present evidence we doubt if they can even be ranged as distinguishable varieties. It is true that in the specimens before us, the continental have more slender horns than the insular; but the peculiar flexure is absolutely the same, and we can discern no difference whatever in the configuration of the skulls. The truth is, as we suspect, that our continental specimens are ordinary, whilst the insular are extraordinarily fine.* It has indeed been suggested to us, that the horns of the banteng are more approximated at base; but an appearance of this in one of the Japanese frontlets under examination is found to be deceptive on inspection. One very remarkable feature in an old bull banteng is the excessive development of bony substance on the forehead, rising up into coral-like asperities three-fourths of an inch above the plane of the frontal bones, above which the cuticle is enormously thickened into a rugged horn-like mass, which is hard and solid enough to turn a musket-ball. This is well shown in the finer of two frontlets before us; while in the other a portion of the same thickened cuticle, continuous with the base of each horn, has not been detached from the latter, which nevertheless is sufficiently well marked,--and hence the deceptive appearance of the horns being more approximated at base. In the Peguan skull before us, the horns are remarkably pale (even whitish), with black tips; and it is worthy of remark that Pennant in his 'Hindustan' notices the existence of white-horned wild cattle in the Indo-Chinese territories; but the Arakan horn under examination is darker, being much the same in hue as the larger Javanese pair. The frontal bones in our Peguan skull are smooth, and they are equally so in the smaller Javanese frontlet before us; though both are heads of old animals, with the frontal suture nearly obliterated: nevertheless, the skin was indurated over the forehead of the latter, and we have never heard of this occurring in the Burmese animal, but have little doubt that it does so. One remarkable fact strikes us upon examining these horns, which is, that the flattening of them at base does not appear until they are fully half-grown; which may well account for the reports of Burmese wild cattle with cylindrical horns! The bisontine-looking horn, however, from the Shán country, has not the peculiar flexure of the present species, and most assuredly cannot be referred to it.*

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* According to Professor Van der Hoeven, this name is founded on the hybrid race often raised in Java and Báli, a figure of one of which we remember seeing among the Hardwicke drawings in the British Museum. If we mistake not, this mixed race, rather than the true banteng, is known by the appellation of "Báli cattle" at Singapore.

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* In a skull from the "Keddah" or Quedda Coast, referred to in our notice of the gaour as being in the United Service Museum, London, and which is divested of the horns, it can nevertheless be seen that the latter must have been of full dimensions.—*Vide* figures in 'Journal of the Asiatic Society,' vol. xi. p. 470. In the same plate is figured the smaller Javanese frontlet hereinafter described, with portions of the indurated skin of the forehead continuous with the horns, occasioning the latter to appear more approximated at base than is truly the case, as noticed above. We have seen, indeed, much greater difference of size in old bull gaour-skulls.

The banteng, as beautifully figured by Dr. S. Müller (who gives coloured portraits of the bull and cow, and of calves young and half-grown), has much more the aspect of the European Bos Taurus than has either the gaour or gayal; and its less flattened horns present a further approximation. There is nothing exaggerated about its figure; the spinal ridge is not more elevated than in B. Taurus and the tail-tuft descends considerably below the hock-joint. There is a good deal of the gayal in its general aspect; but it has longer limbs, and is less heavy and bubaline in its proportions. Indeed, we have heard it compared to a Devonshire ox; but it has nevertheless all the general features of the present group, and is true to the particular colouring —showing the white *stockings*, and having also a great white patch on the buttocks (whence the name leucoprymnus bestowed by MM. Quoy and Gaimard). The shoulder is a little high, with some appearance of the dorsal ridge between the scapulæ, but this slopes off and gradually disappears behind. The rump is also nearly as much squared as in European cattle. Dewlap moderate, with a different outline from that of the gayal, more as in the B. Taurus. Colour of the calf bright chestnut, with a black tail-tuft, and also a black dorsal line commencing from where the ridge should terminate behind;† the white *stockings* having much rufous intermixture at this age. The cows are deeper-coloured, being of a rich light bay, and the old bulls are blackish,—both, however, relieved with the white on the legs, buttocks, lips and hair lining the ears, which last are scarcely so large as in the gaour and gayal, but of similar shape. Sir Stamford Raffles mentions, that "a remarkable change takes place in the appearance of this animal after castration, the colour in a few months becoming invariably red;"* *i.e.*, light bay, as in the female. The general figure, however, is still much more that of the gayal than of European cattle; but (as before remarked) the legs are conspicuously longer than in that animal, the body is much less ponderous, the tail longer, and the head also is much less broad at the forehead. The horns again are very different.

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* Here it may be remarked that the curious small fossil frontlet from Kentucky, with narrow forehead and thick horn-cores, and which we examined in a dealer's shop in London, we now identify for certain as the Boötherium cavifrons of Dr. Leidy, figured and described in the fifth volume of the 'Smithsonian Contributions to Knowledge,' Washington, 1853. It is the same as the Ovibos Pallantis, *De Blainville*, and should therefore now stand as Boötherium Pallantis. A second species existed in the Bos bombifrons of Harlan, also figured by Dr. Leidy, together with Bison latifrons, and another which he terms B. antiquus. Boötherium is evidently a good genus, intermediate between the musk cattle and the bisons.

† The skin of a young calf from Mergui, in the Calcutta Museum, corresponds with that figured by Dr. S. Müller. The same dorsal line occurs in some individuals of the humped cattle.

In form of skull the banteng more resembles the gaour, with the characteristics of that species subdued, only that the frontal ridge does not turn up at all, as it slightly tends to do also in the gayal, occasioning a perceptible hollowness of the broad forehead of that species in a fine bull-skull before us. The horns of the banteng are thrown off at the same angle from the head as in the gayal, or with less of a slant backward than in the gaour, are continued out almost in a line with each other, gradually curving upwards and uncinating inwards, with a less considerable slant backwards at their tips. Such is the usual flexure in the bull, but occasionally the tips incline less inwards: in the cow the horns are small, and tend much backwards. Towards the base they are generally very rugous in old bulls; and the full-grown horn flattens gradually from about the middle to the base; the section of the base being oval and flattened on the lower surface. Colour pale glaucous-green with black tips, and commonly more or less black or blackish noticeable elsewhere.

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* 'History of Java,' vol. i. p. 3. Probably the same would be observed in the nil-gai; and certainly in a black buck of the Indian antelope, in which the colour goes and comes with the "rut." There is a head of an emasculated nil-gai in the Calcutta Museum, which is coloured as in the female, and has small and slender horns, the female being hornless, also a fine stuffed specimen of the castrated antelope, which is likewise coloured as in a female, and has horns similar to those which the doe antelope very rarely puts forth, but we are acquainted with three instances of the fact. *Vide* 'India Sporting Review,' new series, Nos. IV. p. 94, VI. p. 239, and XI. p. 191; and for figure of the horns of a female antelope, *vide* 'Bengal Sporting Magazine,' new series, vol. ii. p. 478 (1845). They resemble those of a castrated buck, but are more slender, their curvature being an open arch and not a twist. Not improbably these horned doe antelopes are barren: a doe fallow deer with one horn was found to have the ovarium of the same side schirrous, analogous to barren hen pheasants with more or less complete masculine attire, &c., &c.

Height of bull at the shoulder about 16 hands. Length of a fine skull, from vertex to tips of intermaxillaries, 20½ inches; breadth apart at orbits posteriorly, 9 inches; bases of horns apart anteriorly, 12¼ inches. The horns of our largest specimen measure 2 feet 8 inches round the curvature outside; circumference at base 18 inches; breadth across at base, measuring above, 6½ inches; greatest width apart, 3 feet 5 inches; and the tips 2 feet 5¼ inches asunder.

The existence of a " wild ox " in Borneo was noticed by Beckman, as cited by Pennant, who also recorded the occurrence of such an animal in Java, and had likewise (as we have seen) obtained intelligence of one " with white horns " in the Indo-Chinese countries. In Java, according to Sir Stamford Raffles, " it is found chiefly in the forests eastward of Pásuran, and in Báli, though it also occurs in other parts of Java." Dr. S. Müller remarks that the banteng is found in Java in territories which are seldom visited by man, as well in the forests of the plains and of the coast, as in those of the mountains up to 4000 feet, where it is tolerably common. " We have likewise seen traces of it," he adds, " in Borneo, and have even received a calf from the Dyáks about a month old. According to Raffles it is found in Báli; but in Sumatra it does not appear to exist."* In Moor's 'Notices of the Indian Archipelago,' p. 2, we read that—" The ox, under the name of tambadao,† is a native of the forests of Borneo:" and at p. 95, it is stated that "the breed of cattle [in Báli] is extremely fine, almost every one of these beasts being fat, plump, and good-looking; you seldom, if ever, see a poor cow in Báli: it is a breed of a much larger size than the common run of cattle in Java, and is obtained from a cross with the wild cow [bull ?] with the same animal. They are generally of a red colour, and all of them are white between the hind legs and about the rump, so that I do not remember seeing one that was not white-breeched. The people have no land expressly devoted to grazing; but let their cattle eat their old stubble or fresh grass of the rice-fields, after the crops have been taken off; and while the rice is growing they let the cattle stray into the commons or woods and pick up what they can get by the road-side. The rude plough is drawn by two abreast, which the plougher drives with one hand while he guides the plough with the other." This account pretty clearly indicates domesticated bantengs; intermingled in blood, perhaps, more or less, with the humped cattle; though there is nought to indicate such intermixture in the notice quoted, but rather that—as in the case of the gayal—both wild and tame exist and interbreed occasionally. However, we have the authority of Professor Van der Hoeven that the Bos leucoprymnus of Quoy and Gaimard is a hybrid banteng; and we have seen a figure of a cow of this mixed race among the Hardwicke drawings in the British Museum, which—as also in the instance of the hybrid gayal we observed alive—partook much more of the general aspect of what may be termed the jungle parent. Sir Stamford Raffles, indeed, notices, in his 'History of Java,' that "the degenerate domestic cows [of that island] are sometimes driven into the forest to couple with the wild banteng, for the sake of improving the breed."

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* Most likely, however, it will be eventually found there, if not also another wild species, the aboriginal stock of the tame cattle described by Raffles. The elephant of Sumatra was considered by the late Prince of Canino to be a peculiar species, and was recognised as such by the late Professor Temminck. The rhinoceros of Sumatra is the Asiatic two-horned species (*Rhinoceros sumatrensis*), found also in the Malayan peninsula and Burmese countries, but not in Java, nor (so far as known) in Borneo; the rhinoceros of Java and Borneo (*Rhinoceros sondaicus*) being hitherto unknown in Sumatra, though found in the Tenasserim provinces, according to Helfer: if so, it will probably be more of a mountain species in the provinces and Malayan peninsula than the other. Of wild hogs, according to Dr. S. Müller, the Sus vittatus inhabits Sumatra, with Java and Banka; S. verrucosus also inhabits Java; S. barbatus, Borneo; S. celebensis, besides the baba-rusa, Celebes; S. timoriensis, Timor and Roti; and S. papuensis, New Guinea: a goodly series of wild swine, to which we have lately added the little S. andamanensis, which needs comparison most with S. papuensis, and with Mr. Hodgson's pigmy hog of the Nipâl-sal Forest, which he styles Porcula salvania; these last three have only a tubercle in place of tail. The Continental species of wild hog have been less studied. We can hardly expect, from analogy with the neighbouring regions, that the mountain forests of Sumatra will prove destitute of wild bovine inhabitants.

† Compare this name with Tamarao in the Island of Mindoro, one of the Philippines.

In the Malayan peninsula, and in suitable districts of the extensive region known as Indo-China, there is much reason to suspect that the gaour, gayal and banteng are alike found. Thus Captain (since General) Low, in his 'Dissertation on Penang and Province Wellesley,' mentions "two species of the wild ox, or bison;" and again, he elsewhere notifies, as inhabiting the same region, in addition to the "bison" or gaour, "the wild ox, of the size of a large buffalo [probably the gayal]; and also a species [the banteng ?] resembling in every respect the domestic ox,"—besides the buffalo. Again, Helfer, in his crude notes on the Zoology of the Tenasserim provinces says,—"Of the ox kind, the Bubalus arni and domesticus are both in a wild state [we do not concede these to be two species]; and of the bisons, the great gaurus is rather rare, but Bison guodus [a misprint for gavœus]* very common;

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* The words may be written to look very much alike.

besides another small [?] species of cow, called by the Burmese F'hain, of which I saw foot-prints, but never the living animal; it remains, therefore, undecided to what species it should be referred."

From what we know of the habits of the three animals, it is probable that the gayal keeps exclusively to the hills, the gaour chiefly to the low or comparatively level country, while the banteng inhabits all elevations, being, if possible, even the very shyest of the three. All accounts seem to agree in this respect. Many years ago, the well known and highly accomplished naturalist, Col. C. Hamilton Smith, addressed the writer on the subject of "a wild ox, inhabiting to the eastward of the Brahmaputra river, and very different from the gaour and gayal. It is simply described," wrote Col. Smith, "as a fine-limbed and deer-like animal, of large size, and of a bright bay colour, exceedingly like a Devonshire ox, very active, fleet, shy, and watchful; living in small herds in the wooded valleys, with watchers on the look out, who utter a shrill warning sound on the least alarm, when the whole dash through the jungle with irresistible impetuosity." These are just the habits of the wild banteng, and pretty much those of its immediate congeners. Another writer, alluding to the Burmese "wild cow, or Sine bar," remarks that "herds of thirty or forty frequent the open forest glades" of the Tenasserim provinces; and our deceased friend, Capt. Gason (formerly of H. M. 32nd Regiment), observed them and killed a bull at a place called Nathongzoo, about 250 miles eastward of Maulmain. They were "excessively timid, and are generally seen feeding in the valleys, often about a large tank. It is a very game-looking animal," remarked Capt. Gason, "with a heavy body, but fine limbs; and stands about 15½ hands high." In no account have we met with any notice of the browsing propensities so conspicuous in the gayal, and infer therefore that it is more of a grazer like the gaour. What its voice may be like we are unaware. Not improbably the wild and domestic cattle of Siam noticed by Crawfurd (*vide* p. 88 *ante*) are of this species; in which case it would be remarkable that, as he states, the tame should often be hornless—scarcely more so, however, than polled or hornless buffalos which sometimes occur. He states that they are never of the white or pied colour, so prevalent amongst the cattle of Hindustan; but of what colour are they? The invariable white patch on the buttocks of the banteng would go far towards enabling us to recognise that species.

Reason and Instinct. By the REV. J. C. ATKINSON, M.A.

(Concluded from p. 6491.)

I TURN now to the discussion of a somewhat different subject, but still one having a near connection with that branch of our inquiry which has till now occupied our attention.

In an early portion of the present series of papers I observed that the first conscious acts performed by a human infant are unquestionably Instinctive acts, and that weeks of its life must elapse before it can be "decisively pronounced that Intelligence is fully operative,—that the child understands,—that some of its actions are certainly, though still possibly but in a small degree, under the influence of something decidedly higher than Instinct" (Zool. 5457). These are facts patent to every one who has a child of his own, or can obtain admission to a friend's nursery.

Now it would not serve any purpose were I to dwell upon the very remarkable stages of development through which the brain of the human fœtus passes, from its first rudimentary appearance up to the time of birth; or the resemblance distinctly traceable between it, in these its successive stages, and the several brains of the different classes of vertebrate animals, as we traverse the scale in the upward direction; but I certainly do desire, in connection with the statements just made relative to the human infant, to draw attention to the fact that at the period of birth the human brain is still imperfectly developed; not perhaps as to all its organs, but as to some two or three only. The cerebellum, for instance, in which is believed to centre the power or function of co-ordinating and regulating the motions of the various members and parts of the body, is still very imperfectly formed; and what is much more to our purpose, so is the cerebrum, and that in several particulars. The two halves of this portion of the brain are not only symmetrical—a most significant token of imperfect or arrested development—but the convolutions are much more simple, possess fewer undulations, and are much less deep and thick in proportion than in adults, and a period of years, to be passed under such circumstances of training and exercise of the faculties as successfully conduce to their due improvement, must elapse before these imperfections give place under a gradual, but unceasing, growth towards complete development.* The cerebellum, however, reaches its perfect development of form and structure at a much earlier period than do the cerebral hemispheres. In other words, in our early infancy those portions of our brain through which our higher intellectual faculties are destined to work eventually are just as unfit for their future work as is that portion which is to enable us,—and much earlier,—to walk, to run, to leap, to perform all those complicated and countless movements of limb or member, or portion of member, on which our comfort and well-being so much depend. No wonder, then, that the first actions of the infant are scarcely more than consensual, and the next in order merely Instinctive; and that the dawning of Intelligence should be slow and faint and indecisive; or that its growth and increase, when distinctly produced, should be but gradual and halting, and so much under the influence of the Emotional and Instinctive faculties. But more than a mere passing notice must be given to the results of proper training and favourable circumstances, as assisting in the development of the brain. The cerebral hemispheres of inferior races of mankind, among whom neglect of mental culture and habits approaching those of brutes are found to prevail—influences certainly unfavourable to Intellectual development, and, as it would appear from what follows, to physical development of the organs of Intellect also—present a symmetrical disposition of the convolutions similar to that in the case of the newly born infant, or of the brute animal.

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* One or two minor imperfections of development might be quoted; but it seems scarcely necessary to do so.

However inexplicable the nature of the connection between mind and nervous matter, it is yet "impossible to explain," says an able physiological writer, "the great superiority of the human brain, both in organization and absolute quantity of nervous matter which it contains, without admitting its connection with the mind, and the influence exerted upon its nutrition and growth by that immaterial principle. We have many proofs to show that the neglect of mental cultivation may lead to an impaired state of cerebral nutrition. It may readily be understood that mental and physical development should go hand-in-hand together, and mutually assist each other." "In fact," writes Tiedemann, "the cerebral convolutions become atrophied, either from continued absence from all cerebral excitement, as well as from any other cause of intellectual weakness."

And what is especially worthy of notice in this connection is, that any such change as may by these means be wrought upon the configuration or dimensions of the cerebrum, may, under certain circumstances, become — so to speak — stereotyped. Indeed this result is implied in what has been already stated with reference to the symmetrical cerebral hemispheres peculiar to peoples of a low or degraded type, and to the shape of skull found to prevail among utterly savage and uncivilized tribes. And the following remarks from Dr. Carpenter are doubly interesting, as showing how the very change we are speaking of is taking place under our own observation, and even to a degree already rendered permanent. "But not only," says he, "may the pyramidal and prognathous types be elevated towards the elliptical;" — and we shall notice what he says on this subject presently,—" the elliptical may likewise be degraded towards either of these. Want, Squalor and Ignorance have a special tendency to induce that diminution of the cranial portion of the skull, and that increase of the facial, which characterizes the prognathous type; as cannot but be observed by any one who takes an accurate and candid survey of the condition of the most degraded part of the population of the great towns of this country, but as is seen to be pre-eminently the case with regard to the lowest classes of fresh immigrants. A certain degree of retrogression to the pyramidal type is also to be noticed among the Nomadic tribes, which are to be found in every civilized community. Among these, as has been remarked by a very acute observer, 'according as they partake more or less of the purely vagabond nature, doing nothing whatsoever for their living, but moving from place to place, preying upon the earnings of the more industrious portion of the community, so will the attributes of the Nomade races be found, more or less marked in them. And they are all more or less distinguished for their high cheek-bones and protruding jaws,' thus showing that kind of mixture of the pyramidal with the prognathous type, which is to be seen amongst the lowest of the Indian and Malayo-Polynesian races."— Human Phys. p. 1076.

The converse of this declension from a higher to a lower type is, as already hinted, also to be met with in the human family. Thus, "the Turks at present inhabiting the Persian and Ottoman empires are undoubtedly descended from the same stock with the Nomadic races which are still spread through Central Asia. The former, however, having conquered the countries which they now inhabit eight centuries since, have gradually settled down to the regular habits of the Indo-European race, and have made corresponding advances in civilization; whilst the latter have continued their wandering mode of life, and can scarcely be said to have made any decided advance during the same interval. Now the long-since civilized Turks have undergone a complete transformation into the likeness of Europeans, whilst their Nomadic relatives retain the pyramidal configuration of the skull in a very marked degree. The great mass of the Turkish people have always intermarried among themselves; and in Persia, the real Persians or Tajiks still remain quite distinct from their Turkish rulers. In like manner even the Negro head and face may become assimilated to the European by long subjection to similar influences. Thus in some of our older West Indian colonies, it is not uncommon to meet with Negroes, the descendants of those first introduced there, who exhibit a very European physiognomy; and it has even been asserted that a Negro belonging to Dutch Guiana may be distinguished from another belonging to the British settlements, by the similarity of the features and expression of each to those which peculiarly characterise his master. This effect could not be here produced by the intermixture of bloods, since this would be made apparent by alteration of colour."—Id. 1075.

It will not, I think, detract from the interest of these remarkable statements if I proceed to connect with them the further statement that precisely analogous changes take place in many families of the brute creation, and that too in both directions, namely, from a higher to a lower type of cranial formation, and *vice versâ.* And this leads me to the expression of an opinion or conclusion which I am afraid will appear, at first sight, paradoxical, if not worse. What I mean is that the influence of man upon the lower creatures, at least upon such of them as are brought very strongly under his influence by the processes of domestication, is attended with different results in different cases, and those results of the most diametrically opposite natures. In some instances the influence of man raises, elevates, almost ennobles the brute creature; certainly induces a psychical improvement which, when considered in its positive amount, is simply marvellous. In other instances, and those probably by very much the most numerous, human influence degrades the brute creature intellectually, and positively robs it of some of its natural psychical endowments, without making amends in any one particular. And to such an extent do these two opposite processess go, that a definite, perhaps very marked, and equally permanent alteration in the form of the bones of the cranium takes place. And further still, I have to observe that in case specimens of these deteriorated animals, with skulls fashioned after a permanently degraded type, recover their freedom, Nature asserts her power in gradually, but surely, reversing the effects of man's influence, and remodelling the skull of the now wild animal until it resumes its original size and conformation.

For the purpose of illustrating the former or elevating process ascribed to man's influence I select the dog, as presenting the most remarkable, as well as much the most common, example of the sort. I need not expend time at this point of our essay, in describing what the dog, under human care and kindness in training, has become intellectually, and—one feels strangely tempted to add—morally. To the question what the dog was antecedently to man's acquisition of power or influence over him, and what the subsequent physiological changes induced in him, we give as an answer the following extract from Dr. Prichard:—"The least domesticated races, and those which have become wild, as the dingo or Australian dog,— the nearest approach to the original type which can be discovered,— differ little in the shape of their skulls and in other characters from the wolf; while the more cultivated breeds, or those which have their faculties most developed, and their habits most changed by domestication, deviate in the same proportion from this form, and in particular exhibit a much more vaulted and arched forehead, and a greater development of the brain. The skull of the Australian dog differs but little from that of a wolf. In both the head is very flat, and the cavity which contains the brain has comparatively very little space. The Danish dog and the mastiff resemble, in the shape of their heads, the Australian dog; and they display as little development of Intellect or Sagacity. In the terrier and hound the skulls are much more arched, and afford a much larger space for the brain. In the shepherd's dog the bones of the skull rise perpendicularly to one half of their vertical extent, and then become arched over the space occupied by the brain. In the spaniel and water-dog the capacity of the cranium is relatively much greater than in the shepherd's dog; and in all these there is a great development of the frontal sinus, which is so considerable as to give the outline of the forehead a direction almost perpendicular to the nasal bones."

As instances of the degrading tendency of man's influence upon brute creatures, both as regards their mental and their psychical, or rather, perhaps, their physiological development, I may quote the horse, the pig, the ox and the sheep. Now I do not mean to assert or to imply that various proofs of the possession of very considerable Intelligence have not been given by many individuals in each of these several families of animals, the sheep perhaps only excepted. But still, generally speaking, the patience of the ox, the stupidity of the pig and the mere docility of the horse are the attributes which are most usually ascribed to these several creatures; and on the whole, I am inclined to suppose it will be conceded that where great Intelligence has been displayed by either horse, ox or pig, it has been in cases where considerable and continued care and kindness and training had been expended on the individuals in question. The general result of domestication on all three families has not been in the direction of improving their intellectual faculties, but the reverse, and, except in the case of the horse, very much the reverse. With respect to the sheep there can be no doubt that it is so; in fact, we find in the authority last quoted these expressions with respect to the present psychical condition of the animal in question:—"The sheep, always stupid or of the most simple understanding, from its birth timid and inert, follows its dam the same feeble and defenceless animal that it is destined to remain through life."

Now in the case of the pig, the changes which result in the conformation of its skull, in consequence of its being suffered to revert to its original wild habits, are thus described by the same writer:—"Their heads become larger, and the foreheads vaulted at the upper part," of necessity to afford room for a brain of increased dimensions, as in the case of the shepherd's dog, spaniel and water-dog quoted a page or two back. Further,—"The difference in the shape of the head between the wild and domestic hog of America is very remarkable. Blumenbach long ago pointed out the great difference between the cranium of our swine and that of the primitive wild boar. He remarked that this difference is quite equal to that which has been observed between the skull of the Negro and European."

In the case of the horse again, "The heads of the wild horses are larger, and their foreheads are of a round and arched form. Pallas has confirmed this observation by an account of a race descended from horses which have run wild in Eastern Siberia. These animals, which are the remote offspring of domesticated horses, now differ from the Russian breed in having larger heads and more pointed ears. * * * He adds that their principal traits, or those which distinguish them from domestic breeds of the horse kind, and which may be considered as characters acquired by the race since it ran wild in the desert, are as follows: they have larger heads than domestic horses with more vaulted foreheads; the ears longer and bent more forward."

I need not occupy my readers' time and my own by looking at and transcribing similar remarks about the ox. Let it suffice to observe that Nature, when the animals just mentioned are given up to her sole influence, occupies herself in remodelling their skulls until they once again resume their original type; and it would be vain to affect to suppose that there is not a corresponding and commensurate increase in the volume of the brain beneath the enlarged and more vaulted forehead.

But can we in any degree account for the original change, contrary to Nature, which renders this second change, in conformity with Nature, necessary? I think we can. Let us bear in mind what is the ascertained result to the brain in the human species by neglect, want of appropriate cerebral stimulus, discontinuance of all intellectual exercise, and the like; and not only to the brain, but eventually also to the dimensions and form of the bones of the cranium covering the said brain—diminution in quantity, a lower condition of development, and a degraded type of conformation. And next let us look at the condition of the pig, the ox, the sheep and the horse,—regarding them collectively, I mean, and not at all individually or in the way of exception to what must be conceded to be the general rule. Almost everything is done for them, and they are left to their own resources, whether of Intelligence or Instinct, for the supply of scarcely one of their various wants. Treat a human creature and his descendants after him for generations as pigs, cows and sheep are treated; suffer him to do no more in proportion for himself, nor to have more scope to occupy himself, than they do and have, and what would be the result, however intellectual he might have been to begin with; however noble and elevated the type of his original cranial configuration? Why, that in the third generation, or sooner, his understanding, his brain, his skull, would be those of—in one word—an idiot! No wonder, then, that our stalled horses and cows, with their alternating experience of cow-house and pasture, and nothing besides,—our folded sheep and sty-imprisoned pigs,—are retrograde in their intelligence, their brains, and the fashion and size of their crania.

Talk of the stupidity, the simple understanding of the sheep! I do not believe in it. If it be stupid and a fool, it is because man has made it so,—not God. It is not found stupid in its native dwelling-places, and where the hand of man has not brought its blighting influences to bear upon its mind. They are wary enough there; and difficult as it may be for the sportsman to approach the different species of wild deer, he will not find the task of getting within rifle distance of a wild sheep an easier one—if indeed nearly so easy—in either Asia or America. Such at least is the evidence of Mr. Atkinson, the Siberian traveller, and of Lieut. Ruxton, the traveller in America.

Even among the black-faced or moor sheep, which abound in all directions on the extensive moors surrounding the place in which I am writing, I have many an opportunity of observing what effect a comparatively wild life—though still such only in a very slight degree—has upon the mind of that species of sheep, as compared with the larger, heavier, more inert and carefully tended Leicester sheep, a few of which are kept here and there on the lowlands. The frequent instances of watchfulness, in the former, speedily detecting the presence of a human or canine intruder, the singular sound, half snort, half hiss, with which they express their alarm and dissatisfaction, the impatient stamp with their fore foot after following close on the strange sharp "Hist!"—as it sounds—all are hints to show what they would soon become, if they were left for a few generations unbullied by sheep-dogs, unshepherded by their owners. But even in them Instinct is made to give place to a sort of Intelligence, superinduced over their natural endowment with that faculty. Once or twice last year I crossed the moor during the lambing season. On one of these occasions my attention was drawn to a lamb that had certainly been dropped during the hour and a half or two hours which had elapsed since my previous passage. The little creature had full use of its limbs; and, at my approach, it bounded off with every symptom of alarm. Here was the instinct of Self-preservation evidently in operation. I whistled; its alarm was increased tenfold, and it hurried far beyond its mother to escape what, its instinct told it, might be danger. The parent ewe in the mean time stood quietly grazing within a few feet of me, taking no further notice than just to raise her head for a moment when I whistled, and emitting a bleat of summons or recall, as she noticed her lamb's hurried flight from her side.

I may be permitted perhaps further to add, in reference to the changes in size and form of the skulls of the animals above noticed, which had, from a state of domestication, reverted to a condition all whose elements were the same as those of their original wild condition, that the alterations were such as to give scope for an increased volume, and, conceivably at least, advanced development of the higher organs of the brain. And I think the inference fairly is, not only that their wild life required an increase of Intelligence in addition to the exercise of their instinct in all its pristine force, but also and consequently that thus one more support is rendered to our theory of the necessary co-existence and co-operation of Instinct and Reason.

There is one matter—which unquestionably forms a part, and an important part, of the subject of our inquiry—which I have not touched upon, and which I confess I feel myself quite incompetent to handle: I mean the Instinct of Insects. The difficulty arises in the apparent Intelligence, often times great Intelligence, in so many of them, combined with the nature of their nervous system, which seems to be constructed with entire independence of anything approaching the nature of a brain or even a substitute for one. More refined physiological discoveries may perhaps lessen or remove this difficulty, especially if it ever should be satisfactorily established—as some have suggested—that "a process of nervous matter, not in the form of a ganglion, may possess the elementary functions of nerve and brain combined in one" (Couch, 'Ill. Inst.' 11). In the mean time Dr. Carpenter disposes of the difficulty in the following manner, though there are several points in his statements as to which I find myself unable to agree with him:—"The whole nervous system of Invertebrated Animals may be regarded as ministering entirely to automatic actions; and its highest development, as in the class of Insects, is connected with the highest manifestations of the instinctive powers, which, when carefully examined, are found to consist entirely in movements of the Excito-motor and Sensori-motor kinds. When we attentively consider the habits of these animals, we find that their actions, though evidently adapted to the attainment of certain ends, are very far from evincing a designed adaptation on the part of the beings which perform them, such as that of which we are ourselves conscious in our own voluntary movements, or which we trace in the operations of the more intelligent Vertebrata.

"The adaptiveness of the instinctive operations of insects lies in the original construction of their nervous system, which causes particular movements to be executed in direct respondence to certain impressions and sensations.

"The type, then, of psychical perfection among invertebrated animals, which is manifested in the highest degree among the social insects, consists in exclusive development of the automatic powers, in virtue of which each individual performs those actions to which it is directly prompted by the impetus arising out of impressions made upon its afferent nerves, without any self-control or self-direction. So that it must be regarded as entirely a creature of necessity performing its specific part in the economy of nature from no design or will of its own, but in accordance with the plan originally devised by the Creator."

Our author at this point subjoins the following note:—"We have not perhaps any right to affirm that there is nothing whatever analogous in Invertebrata to the Reasoning powers and Will of higher animals; but if these faculties have any existene among them, they must be regarded as in a rudimentary state, corresponding with the undeveloped condition of the cerebrum. In none of the Articulata has any trace of this organ been discovered: a rudiment of it, however, has been supposed to exist in the cuttle-fish."

We then find these further remarks in the text:—"The only distinct indication of Intelligence displayed by Invertebrata, is the slight degree of capacity of 'learning by experience' which some of them display: this capacity being limited to the mere formation of associations between mental states called up by different objects of sense, which we observe to be the first stage in the development of mental powers in the human infant. And it is interesting to observe that this educability is less displayed by insects—in which we may consider the automatic tendencies as attaining their greatest development—than it is in spiders, which present in several parts of their conformation an approximation towards the Vertebrated Series."—'Human Physiology,' pp. 665—667.

With this quotation I bring the present series of papers to an end.

J. C. Atkinson.

Danby Parsonage, Grosmont, York,
April, 1859.

Errata.—In the note to this paper, Zool. 6488, *for* The elephants, two *read* The elephants too, *and, two lines lower down, for* set *read* sit.

Remarks upon the Migration of Birds.

By A. G. More, Esq., F.L.S.

It was the apparently exceptional case of a small-billed migrating warbler being found upon our shores in winter that first drew my attention to a movement little noticed, but which, it is believed, will be found to take place regularly in autumn and winter, in a nearly direct line from the East to the West of Europe.

The black redstart is well known to occur every winter at different spots along the channel, as well as in other parts of Great Britain, a country which, for all practical purposes, occupies with regard to Europe a westerly position; yet this redstart scarcely reaches so far North as Scandinavia in its summer migration, though it is common at this season in the more central parts of Europe.

Several herons, as the great egret and buffbacked herons, also the ibis and the little owl, have been seen in England in late autumn or winter, and all these, it is well known, are found during the breeding season to inhabit the eastern and southern more than the northern parts of the Continent. So has the courser,* a bird of the Mediterranean basin, been shot upon Salisbury Plain in October; and the Dalmatian Regulus, from the borders of Asia, was taken in Northumberland at the end of September; White's thrush in January. The little bustard is a still more striking instance of a species indigenous to the East and South of Europe appearing with us during the winter months; and this bird, too, has been observed in the act of migration flying from East to West near the Caspian Sea.

In Devonshire and Cornwall † it is during winter that are found the firecrested Regulus, Richard's pipit, alpine accentor, spoonbill and little bustard; and many birds of the highest rarity in Britain have occurred at the Land's End in September and October, yet can hardly be supposed to have been reared in England: the crested and short-toed larks, woodchat, ortolan, pastor, avocet and ibis must have proceeded from the central or even southern countries of Europe. And the abundant flights of migratory birds which are yearly observed in Cornwall at the period of the autumnal movement include many species that nest rather on the eastern side of England, and certainly do not breed in Cornwall,—*e. g.* nightingale, reed wren, lesser whitethroat, &c.; and it is evident that these birds have no intention of crossing the channel at its narrowest point. Other examples of a short journey from East to West will be found in the tree sparrow, stock dove and Norfolk plover that are seen in the West of England in winter only.

Various birds which visit the Land's End in spring, as the Kentish plover, white and gray headed wagtails, purple heron, ‡ &c., do not go far North in England, and so must be advancing in an easterly direction along the south coast, following at this season a reverse course to that of the autumn.

In Ireland the redstart (probably not the black only) and the crested lark have been obtained in winter; and the blackcap and Norfolk plover are better known in the sister island as winter than summer visitors. I have myself seen a wheatear upon the banks of the Royal Canal in the month of December. The hoopoe has more than once been killed in February, and many of the scarcest occasional visitors to Ireland, as well as Great Britain, have been met with during the autumn and winter months: as examples, the spotted eagle, griffon vulture, spoonbill, avocet, blackwinged stilt, ibis, whiskered and black terns may be quoted; to which perhaps might be added White's thrush and the Sabine snipe (if a good species), and the two African birds, spotted cuckoo and goldvented thrush, both obtained in winter. Nor are the instances in which some of these birds have been noticed in the spring or summer sufficient to invalidate those above quoted, since it is only here wished to prove the occasional occurrence in Great Britain, during late autumn and winter, of species that come from the South-east and East; and we need not be surprised to find birds from any quarter visiting us at either of the periods of the general migratory movement, it being well known that a few species have, both in spring and autumn, wandered to our shores from America* as well as Africa.

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* Other birds no doubt come to us in greater numbers in autumn and winter from the East and South of Europe; but it has been thought best to rely upon the rare species, since they cannot have come to us from a northern latitude.

† For Cornwall I have principally relied upon the numerous and valuable communications of Mr. Rodd to the 'Zoologist.' The Irish occurrences are quoted from Thompson's work; and for Great Britain use has been made of Yarrell's birds and of various notices in the 'Zoologist.' The present paper contains but a short abstract from a large collection of facts, and it is intended to invite discussion upon so interesting and difficult a subject.

‡ This bird has also frequently visited England in winter.

But indeed when we consider the differences presented by the remarkable contrast between the climates termed "maritime" and "continental" by geographers, the former being distinguished by its mild temperature in winter, and more favourable from the moisture of its air to a continuance of insect-life at that season,—while the continental is equally rigorous,—why should not birds by instinct be aware of these differences?

The recent occurrence in Sussex of Sylvia galactotes, a bird of quite southern distribution on the Continent, sufficiently shows that the line of autumnal migration does not lie at all arbitrarily North and South; but, to a great extent, at right angles to the "Isotherms" of winter temperature, which run in a direction of N.W. and N.N.W. in Central and Western Europe, and migration must therefore take place in a line from the N.E. and E. to W.S.W. and W. With future observation I feel little doubt that the streams of migration may hereafter be laid down in a manner analogous to that of the ocean and air currents; and that the laws which govern those streams will be found to depend upon the nicely balanced influences of—1st, prevailing winds; 2nd, physical features of mountain chains and river systems;* and 3rd, the distribution of water and land; as well as by temperature and the all-important consideration of a sufficient supply of food, which are at present thought to be almost the sole cause. It will thus be seen how desirable it becomes, with a view to future generalization, that additional pains should be taken to register exactly all occurrences of our rarest birds. At least the month, and far better the day, are well worth recording where possible, instead of the vague notices of "lately" or "within the last few months," which cannot serve a purpose like the present.

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* At least eight Incessorial and nine Grallatorial birds have crossed the Atlantic; and, if we may trust all the notices, three species of woodpeckers, which, like the belted kingfisher, are not generally credited with enduring powers of flight.

Another point upon which some further information would be very acceptable is with respect to the periods at which the old and young birds move. I believe it is very generally thought that the old males precede the females and young by an interval of several days; but that this rule does not hold quite absolutely I have had good proof by finding female redstarts and blackcaps, as well as males, among the first flights; and if the females are less noticed they are also more retiring in their habits. I have certainly shot both male and female godwits from the same flock in May.

And if in most cases "the females and young" are later in advancing to their breeding haunts, is it of males only or of both sexes that are composed those small detachments of old birds only, which, at least in the case of the dunlin, are the earliest to return in autumn? How comes it, too, that when the birds of this family lay but four eggs, so far smaller a proportion is found among the September flocks, unless it be supposed that most of the parent birds have hastened on by themselves at an earlier period. Yet sometimes at least the female is found accompanying the young brood.

May we find some good observers who will try to solve a part of these most interesting problems! And even if no precise rule can be fixed, why need we despair of discovering something more than is known at present of the general laws? though Natural History, and especially migration, be not reducible to mathematical exactness.

A. G. More.

Bembridge, Isle of Wight,
April 16, 1859.

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* It is believed that the course of rivers and the neighbourhood of the coast are both followed in preference by migratory birds.

Curious Fact in the Nidification of Sparrows.—For some time past I have observed that two branches of a lime tree, which stands about twenty yards from my bed-room window, were half denuded of their bark. It struck me as something curious, for the branches were not dead, so I paid a little more attention to them, and at last was rewarded by discovering the bark-strippers in the very act; they proved to be sparrows foraging for materials for their nests, fairly engaged tearing with their strong beaks the bark from the branches. I saw one flying with a piece up to the houses. I ought to mention that the bark seems to be partly diseased, and seems to be readily stripped from the branch.—*Robert H. J. Gilbert;* 17, *Upper Phillimore Place, Kensington, March*, 1859.

Nidification of Birds: the Common Martin.—By those who maintain that man is governed by reason, and animals by a different principle, which they denominate instinct, it is argued, as a characteristic proof of the nature and influence of the latter, that its actions are invariable, because incapable of improvement by experience. How far such is the case will appear from the following incident. Under the eaves of a house, not so high as to be beyond the reach of any urchin who could procure a rod or fling a stone, a martin had built its nest, which had more than once been destroyed. There is no doubt that under ordinary circumstances these birds would have gone on building their habitation in the same place and manner, if left to themselves and their own resources, although even in such case some important variation in the structure has been known to have occurred. But in the present instance the inhabitants of the cottage were not satisfied to see the labour of their favourites perpetually rendered void, and they set their wits to work, in what manner to secure them from harm. The method adopted was,—to place a small round basket under the eaves, at the place where the nest had been, as a protection from injury below; but it was attended with the inconvenience that the handle prevented it from being pressed into contact with the stone, while the breadth of the basket was so great as to cause the dripping from the eaves to fall within the cavity. It was to obviate this last annoyance that a flat piece of board was laid as a cover on the basket, with the precaution of leaving an opening, not in front, but at the side, for the birds to enter, if they should choose to adopt this new contrivance for their advantage; and they did justice to the kind intentions of their friends by adopting it, and that too in a way of their own contrivance. They began by placing a rim of their usual mortar round the basket, at the border where the covering board rested on it; but in thus rendering it safe and close on every side they observed the caution of leaving a small hole at the side, by which to enter. In this convenient piece of wickerwork, then, they found a cradle in which they were able successfully to rear their brood. But this was not all; another pair of birds had seen the good fortune of their fellows, and they resolved to be sharers in the advantage they were enjoying. The space above the board, and within the arched handle of the basket, was only inferior to the basket itself as a situation for a nest, and there accordingly they proceeded to place it: it was formed of clay, in the usual manner; and here, immediately above their neighbours, they successfully hatched their young. We shall see whether they will adopt the same expedients in another year. The laying hold of a novel, but obvious conveniency to secure an important object, is not the least of the operations of the reasoning powers.—*Jonathan Couch; Polperro, March* 13, 1859.

Three British Spotted Woodpeckers.—I have always thought that old Bewick was right in saying there were three distinct British pied woodpeckers; and the note, in the

'Zoologist,' by Mr. Pickard-Cambridge (Zool. 6444), I think proves it. I transcribe a note from my interleaved Yarrell, writen some years ago. "I cannot help thinking that there are three different specimens of this bird, as Bewick thought. I have three very different from each other; they are sometimes found in Draycot Wood, where one of these specimens were shot. The largest was killed here; the middle spotted woodpecker in Clarendon Park; the small bird in Amesbury Park: these small birds bred in Draycot Park.—*George S. Marsh; Vicarage, Sutton Berger, Chippenham.*

[My correspondent does not describe the differences of the three supposed species, a very necessary prelude to their reception as distinct species. I think, moreover, that Bewick cannot be cited as evidence, except as regards the illustrations of the work bearing his name: he did not write the text.—*Edward Newman*].

Correction of previous Error respecting the Harlequin Duck (Anas histrionica).—I beg leave to correct an error made by me in the 'Zoologist' for 1852 (Zool. 3331) in a note on the "Occurrence of the Harlequin Duck in Banffshire." The specimen therein mentioned was submitted to the inspection of the late Mr. Yarrell, who pronounced it to be a young female harlequin duck, and he has mentioned it as such in the last edition of his work (British Birds, 3rd edition, iii. 366); but I was very sorry to find, shortly after the bird was given to me, that the decision of that illustrious ornithologist was unfortunately wrong, and that it was only a female long-tailed duck (*Anas glacialis*). I may add, that there can be no doubt that the bird in my possession is the identical specimen seen by Mr. Yarrell.—*Edward Newton; Elveden Hall, Thetford, March*, 1859.

Occurrence of Paget's Pochard (Anas ferinoides), *for the second time, in Norfolk.*—A male specimen of this rare duck, apparently in adult plumage, was killed on the 24th of February at Little Wareham on the North-East Coast of Norfolk. The only other example known to have been met with in this county, an immature male, was obtained on Rollesby Broad (in the same neighbourhood), on the 27th of February, 1845. This bird was figured and described in the 'Zoologist' (Zool. 1379), by Messrs. Gurney and Fisher, in their 'Birds of Norfolk,' as a hybrid between the common pochard (*A. ferina*) and the white-eyed pochard (*A. nyroca*), having very strong points of resemblance to both these species; and a long and very interesting paper on the same subject by Mr. Fisher will be also found in the 'Zoologist' for 1847 (Zool. 1778). By the latter communication it will be seen that the Rollesby specimen, together with two other ducks of a similar character,—one purchased by Mr. Bartlett in a London market in April, 1847, the other some years before in Leadenhall market, by Mr. H. Doubleday,—were exhibited on the 13th of April, 1847, at the meeting of the Zoological Society, when, after a careful examination and comparison of the three specimens, both as to external appearance and anatomical peculiarities, it was concluded that they all belonged "to a new and hitherto undescribed species." Mr. Bartlett's bird closely resembled in plumage the immature male from Rollesby, but Mr. Doubleday's, also a male, presented every indication of an adult state, and is, in fact, the same bird figured and described in Yarrell's 'British Birds' as the American scaup (*Fuligula mariloides*, Vigors). The scientific name of F. ferinoides as applied to these ducks by Mr. Bartlett has been very generally accepted by naturalists, and that of Paget's pochard was likewise added, after the late C. J. Paget, Esq., of Great Yarmouth, a very zealous ornithologist. In 'Naumannia,' for 1852, p. 12, under the name of F. Homeyeri, a description, with illustrations, of a pair of ducks killed near Rotterdam, in April, 1850, is given by Herr Bädeker, and on March 28, 1854, these same birds were exhibited by Mr.

Gould at a meeting of the Zoological Society of London. Mr. Bartlett was then present, and expressed himself perfectly satisfied that they were the same species, to which he had given the name of Fuligula ferinoides. This fact was the more interesting, inasmuch as no female of this new duck had till then been met with. Whether "F. ferinoides" is or is not "a good species," or merely a hybrid, as originally supposed, is still a debateable question with ornithologists, the *pros* and *cons* of which might occupy much time and space. Herr Bädeker is evidently convinced that it is entitled to specific distinction (as F. Homeyeri), and I believe Mr. J. H. Gurney, the fortunate possessor of the two Norfolk specimens, has arrived at the same conclusion. I have described this last specimen as an adult male, and I think, from the rich colouring and well-defined markings of its plumage, I am right in so doing; but although in other respects it agrees with the description given of Mr. Doubleday's bird, there is no approach to "jet black" either on the neck or breast, but the latter has somewhat of a purple gloss with a few indistinct dark lines along the tips of the feathers.—*H. Stevenson ; Norwich, April,* 1859.

Note on the Occurrence of the Dartford Warbler in Norfolk.—A young male of this species was caught, by a dog, in a furze-bush on Yarmouth Denes, on the 25th of February. This bird was sent to a birdstuffer in this city, together with a stoat killed at the same time, and was intended to be placed in the mouth of the "varmint," when fortunately it was recognised as a rarity. I am aware of but one other specimen of this warbler having been met with in this county, which was also obtained on Yarmouth Denes some years ago.—*Id.*

Occurrence of the Little Crake and Schintz Sandpiper at Hastings.—A beautiful male specimen of the little crake (*Gallinula pusilla*) was caught near this town on Friday, the 15th, and brought to me alive. It was discovered on the bank of a small stream near the sea. I have set up the bird, and it is now in my collection. I do not know whether the capture of a Schintz sandpiper (*Tringa Schintzii*), in this neighbourhood, on the 8th of October, 1857, has been brought under your notice; if not, the following particulars may be interesting to some of your readers. The Schintz sandpiper was in company with a rednecked phalarope (*Phalaropus hyperboreus*), the latter swimming, and the Schintz sandpiper wading in a flooded meadow, about two-hundred yards from the sea, and directly opposite to the village of Bexhill, Sussex. They were not at all shy, and permitted me to approach them within easy gun shot, and to watch their motions for several minutes, when seizing a favourable opportunity I fired and killed them both; they both proved to be male birds. I set them both up, and the Schintz sandpiper is now in the possession of J. H. Gurney, Esq., M.P., of Catton Hall, Norfolk. I find neither Mr. Yarrell nor Mr. Morris mentions more than one instance of the Schintz sandpiper having been taken in this country, and that in Shropshire, and is in the collection of Sir Rowland Hill.—*Robert Kent ; St. Leonards-on-Sea, Sussex, April* 20, 1859.

Occurrence of live Toads underneath a Bed of Clay—In the early part of this month, two live toads were dug out from the bottom of a bed of stiff brick clay, in the neighbourhood of Bridgwater, at the depth of fourteen feet from the surface of the ground; a third was killed by the spade before they were observed. This bed of clay rests on peat, and the toads were found at the junction of the two beds, in a small domed cavity, about the size of the crown of a man's hat. On being exposed to the air they uttered a squeaking cry, resembling that of a rat, but in about a minute they seemed reconciled to their new destiny, and moved freely about. They were kept in a jar for a few days, and then placed at liberty in a garden, where I suppose they are still living. The living ones were about two inches in length, but narrow in proportion, and of a rather lighter colour than toads usually are; the one which was killed was very much larger. The clay under which they were buried had been gradually dug out from the surface, since about the beginning of the year, but the last five feet of depth was not dug till the day on which they were discovered. After about two feet of the surface, the clay is very close and adhesive, and far too moist to admit of cracks being formed in it, even in the dryest summers.—*Thomas Clark; Halesleigh, March* 25, 1859.

[Will my correspondent give the name of any scientific man who was present at this exhumation? I am confident he is too careful a naturalist to accept such a statement except on the highest and most unequivocal testimony; and I look forward with great interest to a correspondence with the actual discoverer.—*Edward Newman*].

Naturalization of the Edible Frog (Rana esculenta, *L.*) *in England.*

By ALFRED NEWTON, M.A., F.L.S.

ON the 8th of June, 1853, as my brother Edward and myself were driving along the road between Thetford and Scoulton, in the county of Norfolk, we heard a most singular noise, and one we were unable to attribute to any cause known to us, proceeding from an adjacent field. We stopped, and he, getting out, entered the field,—a small meadow,—presently returning to me with the information that the extraordinary sounds came from a pond, hitherto hidden by the hedge, and that the utterers of them were no other than the edible frogs. Of course I went immediately to satisfy myself, and there, sure enough, were the frogs,—some swimming to-and-fro in the water,—some sitting on the aquatic plants, with which the pond was choked, and these last were exceedingly noisy, puffing out their faucial sacs, like so many dwellers in the cave of Æolus. After observing them for a little while, we tried to obtain some specimens, but herein fortune favoured the frogs: we had no aggressive weapons beyond a walking-stick and an umbrella, and they were wary to a degree and exceedingly active. However, by persevering we became possessed of four individuals, three, I regret to say, dead, and one, an indiscreet youth whom we found rambling about the grass, alive. By the time these were obtained our offensive operations had so be-muddied the pool and disturbed the growth of the water-weeds, that the rest of the colony sought safety in its turbid depths, and we could discover no more. We therefore retired with our spoils: the deceased were decently embalmed, and are now in the Norfolk and Norwich Museum. Our prisoner survived the journey home and lingered for three months in a foot-tub, usually resting on a floating island of cork, from which he would leap into the water whenever a fly was thrown for him on to its surface, and seizing it swim back to his station, when he disposed of it in about two gulps, though, indeed, if it happened to be a large blue-bottle a faint buzzing might be heard for some seconds after it had disappeared from the light of day.

I lost no time in communicating the discovery we had made to Mr. J. H. Gurney, who in reply informed me that some years before Mr. George Berney had imported a great many animals of this species alive, and had liberated them in this country. Here the matter rested until a few days ago, when I received from the gentleman last named an account of his proceedings, and, having his permission to do so, I extract some portions of his letter, written from Morton Hall, Norwich, March 25, 1859, which, I think, will be found interesting. Mr. Berney says:—"I went to Paris in 1837; some letters which I wrote from that place, and which now lie before me, fix the date with certainty: I brought home two hundred edible frogs and a great quantity of spawn. These were deposited in the ditches in the meadows at Morton, in some ponds at Hockering, and some were placed in the fens at Foulden, near Stoke Ferry.

"They did not like the meadows and left them for ponds. I found some in a pond at the top of Honingham Heights, near the old telegraph. I have measured the distance on a map, three chains to an inch, this morning, and find it to be in a straight line 1¾ mile and forty yards. In the whole distance there is not one drop of water, not a puddle as big as a hand-bason, to be found between the meadows where they were placed and the pond in which I saw and heard them. It is impossible to mistake their cry or the two bladders that stick out of their heads when they cry.

"In 1841 I imported another lot from Brussels. In 1842 I brought over from St. Omer thirteen hundred in large hampers made like slave-ships, with plenty of tiers; these were moveable and were covered with water-lily leaves stitched on to them, that the frogs might be comfortable and feel at home. These were dispersed about in the above-mentioned places, and many hundreds were put into the fens at Foulden, and in the neighbourhood."

Now the place where we found, in 1853, what were doubtless the descendants of Mr. Berney's importations, is nearly equidistant from the two districts mentioned by him in the above extracts, being about thirteen miles from each. Should any of the readers of the 'Zoologist' wish to visit the spot, I beg to refer them for further particulars (as I myself shall most likely be abroad most of the summer) to Mr. T. Southwell, of Hempton, near Fakenham, who, I doubt not, will willingly furnish them with the information necessary to re-discover it. If they find it inhabited, I only trust they will be careful not to diminish the number of the colonists too much, and that they will record in the pages of this magazine their observations on the present condition of the settlement, of which I have no knowledge whatever, never having re-visited the locality.

How far the facts above related will serve to answer the inquiry propounded nearly twelve years since by Mr. J. Wolley (Zool. 1821) "Is the Edible Frog a true Native of Britain?" I do not presume to say, but I will merely draw attention to one point, namely, that, as appears from Mr. Berney's letter, upwards of 1500 edible frogs, besides spawn, had been, by him alone, imported into the east of England, some of them six years and all more than a whole year, before Mr. C. Thurnall's discovery of the species, in September, 1843, at Foulmire fen in Cambridgeshire (Zool. 393).

Alfred Newton.

Elveden Hall, Thetford.
April 5, 1859.

A Beautiful Gurnard.—When trawling in the Dee for shrimps, &c., I have frequently taken a small gurnard of very beautiful appearance. It is generally from four to six inches in length, and the body is of a pale reddish colour. When held in the hand there is nothing remarkable to be observed about it, but if placed alive in a tub of water a wonderful change comes over it. The large pectoral fins previously folded up are now spread widely out, and display a border of the most brilliant turquoise blue. There is also a large black patch on the upper surface of the fin which is studded with spots of the same colour. Altogether it reminds one forcibly of a butterfly, more especially of a South American species which is similarly studded with blue spots. Were it not for the spots being blue instead of white, I should almost imagine it to be the little gurnard (*Trigla pœciloptera*) of Yarrell, which from his description seems to be taken in the same sort of situations. Perhaps some of your readers may be able to enlighten me on the subject. I may add that it seems to do pretty well in confinement, and I cannot imagine a more beautiful fish for the aquarium. *Alfred O. Walker; Chester, March* 29, 1859.

[Is not this the young of the Sapphirine gurnard, so remarkable for its beautifully blue pectorals?—*Edward Newman*].

The Shower of Fishes.—You ask if some of your correspondents will enlighten you on the subject of "The Shower of Fishes in the Valley of Aberdare:" I have seen the fish sent as having been taken out of the rain pool referred to; they are very young minnows. On reading the evidence it appears to me most probably to be only a practical joke of the mates of John Lewis, who seem to have thrown a pailful of water with the fish in it over him, and he appears to have returned them to the pool from which they were originally taken. The fish forwarded are very unlike those taken up in whirlwinds in tropical countries, and we must make allowance for unintentional exaggerations of quantity, &c., in an account given a month after the event had occurred.—*J. E. Gray; British Museum, April* 2, 1859.

[In a small tank in the Zoological Gardens, Regent's Park, are a few little fishes purporting to be the identical specimens submitted to Professor Owen's inspection: one only of these is a minnow, the rest are the smooth-tailed stickleback (*Gasterosteus leiurus*). Dr. Gray is without doubt correct in attributing the whole affair to some practical joker.—*Edward Newman*].

The Mode by which the Pholas bores.—The mode by which the Pholas bores its habitation, even in the hardest rock (?), has long been a subject of ingenious speculation amongst naturalists. None of their theories advanced, however, have been accepted as fully satisfactory; and no one previous to myself has had, I believe, the satisfaction of seeing the animal in the operation. I have therefore great pleasure in giving a short account of the manner in which I have seen the act performed. The aquarium, one might have supposed, would have afforded an easy means of solving the problem. But here we meet a fresh difficulty from the supposed fact that the Pholas, being once dragged from its lone abode, would not take the trouble to excavate another. His theory appeared to me most unnatural and improbable; and my opinion seemed to be further borne out from the fact that old logs of wood thrown up by the waves were frequently covered with holes of different sizes and depths from one-eighth of an inch to the entire thickness of the log. These holes appeared to me evidently made by Pholades, and to have been almost immediately abandoned, either through caprice or necessity. The latter we may frequently suppose to be the case; when the log, resting quietly at the bottom of the sea, is pitched upon by a houseless Pholas, and operations commenced, when the ruthless storm drifts the log on shore and hurls the Pholas once more at the mercy of the winds and waves. There is another case, in which the Pholas may require a fresh habitation, for procuring which we should suppose Nature had given it the means: it is this. Many of the logs tenanted by Pholades are so thin that they would serve the growing mollusk but a short time; and, moreover, wood and other substances used by them, being of a perishable nature must render a fresh abode frequently necessary. Having, therefore, procured several of these mollusks in pieces of timber, I extracted one and placed it loose in my aquarium, with the vague hope that it would perforate some sandstone, on which I had placed it. It possessed the powers of locomotion, but made no attempt to bore. I then cut a piece of wood from the timber in which it had been found, and placed the Pholas in a hole, a little more than a quarter of an inch deep. Its shell being about two inches long, this arrangement left about an inch and three-quarters exposed. After a short time, the animal attached its foot to the bottom of the hole and commenced swaying itself from side to side, until the hole was of sufficient depth to allow it to proceed in the following manner. It inflated itself with water, apparently to its fullest extent, raising its shell upwards from the hole; then holding by its muscular foot, it drew its shell gradually down. This would have produced a perpendicular and very inefficient action but for a wise provision of Nature. The edges of the valves are not joined close together, but are connected by a membrane (extension of the mantle), and instead of being joined at the hinge (umbo) like ordinary bivalves, they possess an extra plate, attached to each valve of the shell, which is necessary for the following operation. In boring, this mollusk, having dilated itself with water, draws down its shell within the hole, gradually closing the lower anterior edges until they almost touch. It then raises its shell upwards, gradually opening the lower anterior edges and closing the upper, thus boring both upwards and downwards. The spines are placed in rows, like the teeth of a saw; those towards the lower part of the shell being sharp and pointed, while those above, being now useless, are not renewed. So far for the mode of boring; but how to account for the holes fitting the shape of the animal inhabiting them? I boldly assert that this is only the case when the animal is found in the same rock or wood which it entered when small. This mollusk evidently bores merely to protect its fragile shell, and not from the love of excavating; and in this opinion I am borne out by my own specimens. The young Pholas, therefore, having found a substance suitable for its habitation, ceases to bore immediately that it has buried its shell below the surface. It remains quiescent until its increasing growth requires a renewal of its labours. It thus continues working deeper and deeper until the substance fails; when it has nothing for it but to bore through, and seek a fresh place, where it may find a safe retreat. The scrapings, &c., made during the operation of boring are expelled with considerable force from the syphonal tube.—*John Ross; Talacre, Rhyl, North Wales, April* 9, 1859.

Larva of Coremia munitaria.—Last June, Mr. Chapman, of Glasgow, kindly sent me eight eggs of the above. They hatched the day after they reached me. Mr. Chapman did not know their proper food, so I tried dandelion, but they did not like it. I then tempted them with groundsel, which they devoured with avidity. After the first moult, three died, and the remaining five seemed disposed to follow their example. However they continued to eat slowly, without increasing much in size throughout the summer and autumn. In January they began to feed again, rapidly increasing in size. By the beginning of March, they were full fed, and about a fortnight since became pupæ. The following is a description of the larva, when full fed. Length, one inch; ground colour, dull green or brown, very variable; segments pink or flesh-coloured. The body is slightly sprinkled with black dots, with two very distinct blotches on the sixth and seventh segments, the latter being the largest. The caterpillar spins up in moss, and the pupa is brown. I am now breeding lovely specimens (forced) of Eupithecia assimilaria from larvæ beaten off black currants. As I do not wish to anticipate my friend Mr. Crewe, I withold any description of the larva.—*J. Greene; Cubley Rectory, Doveridge, Derby, April* 8, 1859.

On the Solenobiæ of Lancashire, &c.—Lately the weather has been so changeable here that I kept postponing my journey to the Moors for my S. triquetrella, but I went on Friday: the first thing that occurred after my arrival at the locality was nearly two hours rain; I then turned over at least a ton weight of big stones, and found the cases sought were very scarce, and, after all my trouble, the larvæ had in every case already assumed the pupa state, so that all my labour was thrown away, and another year must elapse before we get the larvæ. My cases of S. inconspicuella have been kept out of doors, and the last few days their inmates have been making their appearance. I have also bred a few females fromt he cases found on beech trees at Dunham Park, but not a single male; this is my fifth year, and no males. The female from these cases is quite distinct from S. inconspicuella ♀; though the cases are larger the females are smaller, and the anal tuft is not half the size that it is in S. inconspicuella. In May I hope to send you a very distinct species that feeds on the trunks of fruit trees at Bristol; unfortunately these also are all females, and no males as yet. You seem to be in doubt as to the food of these case-bearing insects; it is the fine powdery lichen that is met with on most trees, walls, old palings, &c.; on it I have fed Talæporia pseudobombycella, Solenobia triquetrella, S. inconspicuella, Xysmatodoma argentimaculella, X. melanella, &c. Passing the wall where X. argentimaculella occurs, I gathered a few of the larvæ in their queerly formed bags.—*R. S. Edleston; Bowdon, near Manchester, April* 12, 1859.—'*Intelligencer*.'

Habits of Nepticula argyropezella.—Last October and November I met with some yellow larvæ, mining close to the foot-stalk in leaves of Populus tremula; from these I have now bred specimens of a bluish black Nepticula, with very large silvery cilia, a minute white spot on the outer margin of the anterior wings, and a larger spot on the inner margin, nearer to the tip of the wing; this Mr. Stainton considers N. argyropezella, though much blacker than captured specimens. The egg appears to be deposited, not on the leaf, but on one side of the long stem, about a quarter of an inch from its junction with the leaf; the young larva, penetrating the stem, burrows to the leaf, which it enters at the midrib, and mines the upper cuticle, rarely passing through a rib, but completely devouring, as it goes, all the substance between the middle and one side rib, thus forming a wedge-shaped mine, with the excrement irregularly scattered; the larva, when full fed, emerges on the upper side of the leaf, and forms on the ground a flat, pale brown and rather woolly cocoon, from which the pupa is protruded on the escape of the perfect insect. From the mode of mining, it is obvious that, unlike most Nepticulæ, only a single larva can be nourished by each leaf, and they may be collected better in the fallen leaves than in those yet on the trees.—*P. H, Vaughan; Redland, Bristol.*—*Id.*

Proceedings of Societies.

ENTOMOLOGICAL SOCIETY.

March 7, 1859—Dr. GRAY, President, in the Chair.

Donations.

The following donations were announced, and thanks ordered to be presented to the donors:—'The Transactions of the Linnean Society of London,' Vol. xxii. Pt. 3; presented by the Society. 'Konigliga Svenska Fregatten Eugenias Resa omkring Jorden under Befal' af C. A. Virgin, aren 1851—1853; by the Royal Academy of Sciences of Stockholm. 'An Accentuated List of British Lepidoptera,' 3 copies; by the Entomological Societies of Oxford and Cambridge. 'Journal of the Proceedings of the Linnean Society,' Supplement to Botany, No. 1; by the Society. 'Proceedings of the

Royal Society,' Vol. ix. No. 33; by the Society. 'The Journal of the Royal Agricultural Society of England,' Vol. xix, Part 2; by the Society. 'Tijdschrift voor Entomologie uitgegeven door de Nederlandsche Entomologische Vereiniging,' Vol. ii., Parts 2 and 3; by the Netherlands Entomological Society. 'Insecta Caffrariæ,' Part ii.; by the Author, Professor C. H. Boheman. 'The Zoologist' for March; by the Editor. 'The Athenæum' for February; by the Editor. 'The Literary Gazette' for February; by the Editor. 'The Journal of the Society of Arts' for February; by the Society. 'A Manual of British Butterflies and Moths,' No. 26; 'The Entomologist's Weekly Intelligencer,' Nos. 124—127; by H. T. Stainton, Esq. 'Linnæa Entomologica,' Vol. xiii; by the Entomological Society of Stettin. 'Description of New Species of Phytophagous Beetles;' by the Author, J. S. Baly, Esq. 'A Catalogue of British Coleoptera,' Part 2; by the Author, G. R. Waterhouse, Esq.

Election of a Member and Subscriber.

The Rev. Evan Lewis, B.A., of Rothwell, Northamptonshire, was balloted for, and elected a Member, and W. B. Tegetmeier, Esq., of Muswell Hill, a Subscriber to the Society.

Exhibitions.

Mr. Stevens exhibited two specimens of Petasia nubeculosa, which had that morning emerged from the pupæ: he had reared the larvæ from eggs received from Perthshire, and the insects had passed two winters in the pupa state.

Mr. Stevens also exhibited some butterflies, chiefly Pieridæ, sent from Siam by M. Mouhot, and some beautiful Micro-Lepidoptera, taken by Mr. Diggles at Moreton Bay.

Mr. Douglas exhibited a box containing 1300 specimens of Coleoptera, taken during the last month, chiefly in the neighbourhood of Lee, but a few were from Hammersmith Marshes and Darenth Wood, amongst them were the following:—

Stenus solutus.
„ pubescens
Sunius intermedius
Calodera æthiops
„ nigrita
„ riparia
Phlœopora reptans
Sericoderus lateralis
Oxypoda n. sp.?

Stenolophus exiguus
Gyrophæna lucidula
Euryusa laticollis
Homalota flavipes
Thiasophila angulata
Quedius brevis
Saprinus piceus
Dendrophilus pygmæus

Found in nests of Formica rufa.

Mr. Douglas also exhibited a monstrous species of Pulex found in grass at the margin of a pond, and some larvæ, supposed to be those of Trinodes hirtus, found under loose bark of oak, also a specimen of Rhyzophagus politus, *Hellw.*, *Fab.*, a species new to Britain, taken by sweeping in a ditch at Lee, in June.

Mr. Westwood exhibited a drawing of the larva of a species of the Dipterous Genus Thereva, remarkable for the anomalous development of the abdominal segments which were comparatively of so large a size, each being also transversely divided by an impression that there appeared to be double the usual number of joints, which added to the head, three thoracic segments (of the usual size) and the anal segment give the appearance of twenty-one segments, being eight more than the usual number; the eight abdominal segments being as it were duplicated, the alternate ones presenting a minute lobe on each side; the head is extremely small

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MR. J. C. STEVENS begs to announce that he will sell by Auction, at his Great Room, 38, King Street, Covent Garden, in the course of the month f May, the NATURAL HISTORY COLLECTIONS of the late T. C. Heysham, Esq., of Carlisle. They include Birds, Eggs, Insects, Shells, and Botanical Specimens, he whole of which are British. Catalogues are preparing.

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